

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

To:

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Applicant's or agent's file reference
PXWO00234/2004

IMPORTANT NOTIFICATION

International application No.
PCT/EP2004/000449

International filing date (day/month/year)
21.01.2004

Priority date (day/month/year)
24.01.2003

Applicant
HERGUIDO FO, Claudi

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international
preliminary examining authority:



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PXWO00234/2004	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/EP2004/000449	International filing date (<i>day/month/year</i>) 21.01.2004	Priority date (<i>day/month/year</i>) 24.01.2003	
International Patent Classification (IPC) or national classification and IPC E02F3/36			
Applicant HERGUIDO FO, Claudi			
<ol style="list-style-type: none"> 1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 6 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i>) a total of 20 sheets, as follows: <ul style="list-style-type: none"> <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions). 			
<ol style="list-style-type: none"> 4. This report contains indications relating to the following items: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input checked="" type="checkbox"/> Box No. VI Certain documents cited <input checked="" type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application 			
Date of submission of the demand 23.11.2004		Date of completion of this report 11.02.2005	
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>		Authorized Officer Laurer, M Telephone No. +49 89 2399-7079	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/000449

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

4-10	received on 24.11.2004 with letter of 23.11.2004
1, 1a, 2, 3, 3a	received on 13.01.2005 with letter of 13.01.2005

Claims, Numbers

1-7	received on 13.01.2005 with letter of 13.01.2005
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Drawings, Sheets

1/5-3/5, 5/5	received on 24.11.2004 with letter of 23.11.2004
4/5	received on 13.01.2005 with letter of 13.01.2005

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-7
	No: Claims	
Inventive step (IS)	Yes: Claims	1-7
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement;

1 Novelty and inventive step

1.1 In the terms of independent claim 1, EP-A-1156161 (=D1) shows in figures 1-4, a quick coupling device (2, 3) for coupling tools (201) on machines, said machines comprising an articulated arm (1) having a distal end portion to which an rigid tool (201) is couplable,

wherein the quick coupling device (2, 3) comprises:

- an adaptor (3) joinable to said articulated arm (1) through at least one master pin (401), the adaptor (3) comprising a substantially flat base plate (307) with first side walls (306), and displaceable locking means (7) protruding transversely through the side walls (see figures 3, 4); and
- coupling means (2) attachable to the tool (201) and comprising rigid hooks (203) engageable with said at least one master pin (401) and second side walls (205) with openings (204) aligned with the displaceable locking means (7) of the adaptor (3) when the device is in use in its locking position (see figure 3),

wherein the first side walls (306) of the adaptor (3) are, in use, locked between the second side walls (205) of the coupling means (2),

wherein at least a part of the first side walls (see the conical portions at the outer side of side walls 306 in figure 3, which are considered as equivalent to the embodiment of claim 2 or figure 7 of the current application) comprise inclined surface portions (conical portions in figure 3) converging in the coupling direction (*alternatively*: and/or at least a part of the second side walls of the coupling means comprise converging second inclined surface portions), such that the base plate (307) of the adaptor (3) is in contact with a corresponding substantially flat-surfaced portion (207) of the tool (201) when the adaptor (3) is locked onto the coupling means (2) and tool (201, see figure 2), respectively, by engaging the displaceable locking means (7) with the openings (204) of the coupling means (2). Thus, claim 1 is novel Article 33(1)(2) PCT.

1.2 The distinguishing technical features are:

the coupling means (1) of the tool (3) comprises four rigid hooks (5, 5', 6, 6') located on the four ends of the second side walls (9) of the coupling means (1), a

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pair of rigid hooks (5, 5') being located at a front portion and a pair of rigid hooks (6, 6') being located at a rear portion, said rigid hooks (5, 5', 6, 6') being positioned so that the at least one master pin (7) is able to be coupled with both the pair of front hooks (5, 5') and with the pair of rear hooks (6, 6'), so that the tool (3) is able to be coupled and fixed to the adaptor (2) in two different positions, at an angle of 180° with respect to one another.

- 1.3 The resulting technical effects can be summarised as:
Enabling attachment of the tool in two working orientations.
- 1.4 The objective technical problem could be formulated as: Increasing the versatility of such a quick coupler.
Coupling means comprising four rigid hooks so as to enable a "normal" coupling orientation and an "inverse" coupling orientation of the tool are not known in their present form in the available relevant prior art.
FR-A-2701047 (=D5) and DE-U1-20006408 (=D6) show movable hooks on the adaptor side enabling the coupling of a tool in a "normal" and an "inverse" orientation. But, the combination of these documents D1 and D5 or D1 and D6 would not be obvious and would not result in the claimed subject-matter. Thus, claim 1 complies with Article 33 PCT.
- 1.5 The dependent claims also comply with Article 33 PCT (PCT-Guidelines Chapter 13.19, Rule 6.4(b)).

Re Item VI

Certain documents cited;

2 Certain published documents

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 03/027401	03.04.2003	25.09.2002	26.09.2001

Re Item VII

Certain defects in the international application;

- 3 The formulation of the independent claim does not comply with Rule 6.3 PCT

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because the preamble of the independent claim should comprise all the features known from prior art D1, such as outlined under paragraph 1.1, whereas the "characterising portion" should comprise the features according to paragraph 1.2.

EXPLANATION SHEET

- 1 -

DESCRIPTION**"Quick-coupling device for tools on diggers or similar machines"**5 Technical field of the invention

The invention refers to a quick and reversible coupling device for tools such as shovels, buckets, hammers, clamps, grippers, etc., on machines, especially agricultural, transport, lifting and earth-moving machines such as diggers, back-diggers or similar.

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Background of the invention

Various quick replacement or coupling devices currently exist for tools on machines used to move earth. Said devices comprise a first body with coupling elements, such as fixed claws, which clamp onto master pins or coupling axles on a second body, which is separate from the tool which is to be coupled to the machine.

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Some embodiments of known coupling devices also use secondary movable coupling mechanisms. This is the case, for example, in patents ES 2102548 and WO 95/16831.

ES 2102548 describes a quick-coupling device in which the movable elements of the first body are two locking shafts, which are essentially cylindrical, and the free ends of these are in the shape of a truncated cone, the angle of the cone matching that of the openings on the locking plate of the second body, which is separate from the tool, and also said locking plate is sloped, on its rear part, which fits the corresponding slope of the contact surface of the first body, thus helping the contact surfaces of the first and second bodies to lock together.

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WO 95/16831 has a coupling device also made up of two bodies, the first of these being separate from the tool and the second being separate from an articulated arm of the machinery. In the embodiment, as well as having a coupling axle in one of the two bodies and claws for grasping the coupling axle on the other body, the device has a movable element on one of the bodies, which is wedge-shaped, which operates in conjunction with a fixed element on the other body working in the form of a hook, in such a way that in the coupling position, the wedge moves beneath the hook under the action of a piston or similar. *<insert text of annexed sheet 1a>*

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Due to the heavy-duty work the tools used are subjected to in this type of machinery, the coupling devices known suffer a high level of wear and tear for which the coupling devices, or one of their parts, have to be changed or replaced fre-

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- 1a -

EP 1156161 describes a quick-coupling device for attaching a tool to an excavator comprising at least one main working arm; this device comprises a main body provided with two side walls each connected at the rear to this working arm by a pin housed in holes in these walls to allow it to be rotated relative to the said arm by the movement of excavator levers connected to the body by a pin housed in holes in these walls and at the front to upper walls of this tool by second pins for locking them onto this tool; and these second pins are able to extend out of these side walls and be housed in holes formed in these upper walls of the tool under the action of control means mounted in this body for automatically inserting and removing them into and from these holes, these upper walls being provided with rear hook means for attaching the tool to pins.

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EXPLANATION SHEET

- 2 -

quently, and the machines must be stopped to carry out any change required to avoid the possible breakdown or breakage of the parts which suffer the most wear. The use of said devices therefore makes them more costly than desired and the maintenance required is very expensive.

5 The wear and tear suffered on the devices is caused especially by the concentration of loads on small surfaces and the tolerance or play that exists between the different bodies making up the device, and with every movement the tool makes there is unwanted friction which, over time, reduces the initial setting conditions, producing undesirable movement in the matching of parts.

10 In addition, a common problem of known embodiments, is the difficulty involved in coupling up the different bodies making up the device (a first body separate from the arm of the machine and a second one separate from the tool), since assembly is difficult when the machine operator, manoeuvring the arm from the cabin of the machine, has to match up the two parts or bodies of the device. This
15 manoeuvre is made even harder when the tool is resting on uneven ground or if its slope is different from that of the ground under the machine on whose articulated arm the particular tool is to be coupled.

Similarly, in the embodiments known, master pins or dowel pins are used for joining up the body onto the end of the articulated arm of the machine, while said
20 body and the tool are coupled via a third master pin and the other claws on the other body. Such configurations produce even more wear and tear of the parts as well as increasing the weight of the quick-coupling devices.

Lastly, the devices known are not suitable for coupling in different positions, so that if the tool is to be coupled the other way round, turned 180° with respect to a
25 vertical axis, a second tool is required whose means of gripping are configured in reverse, and for this two different tools are needed, which therefore results in a greater investment in material.

It is also noted that there is no system whereby the machine operator can know if the bodies have been coupled together correctly and if the movable coupling
30 elements are in the required position for the machine to function.

Explanation of the invention

To provide a solution to these problems, an explanation will be given of the quick and reversible coupling device for tools on machines, especially transport and
35 lifting machines, earth-moving or digging machines, such as diggers, back-diggers or similar, said machines comprising an articulated arm ^{coupling} at the end of which the tool
< having a distal end portion to which a rigid tool is couplable >

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~~It is coupled so that it cannot move.~~

The device is, in essence, characterized in that it comprises:

- an adaptor joined to said articulated arm via at least one master pin and, in one of its ends, made up of a base which is essentially flat and side walls, said adaptor also has fixing means, which move perpendicularly through said side walls; and
- means of coupling on the tool, which comprise of rigid hooks for receiving the ends of the master pin and side walls with perforations for receiving and holding, by locking, the movable fixing means of the adaptor,

the outer surfaces of the side walls of the adaptor and/or inner surfaces of the side walls of the coupling means having, at least partly, converging slopes suitable for gradually housing the adaptor in the coupling means of the tool, so that, in the coupling position, the base of the adaptor is in contact with a corresponding essentially flat-surfaced part of the tool, or coupling means, and the fixing means is introduced in the perforations of the side walls of the tool. *insert text of annexed sheet 3a*

According to a preferred embodiment, the outer surface of the side walls of the adaptor have sloping guiding surfaces around the protruding ends of at least one master pin, said surfaces being cone-shaped with an imaginary axis being coincident with the longitudinal axis of the master pin.

In another preferred embodiment, the outer surfaces of the side walls of the adaptor have, at least partly, slopes which converge in the direction of coupling of the adaptor on the tool, insofar as the inner surfaces of the side walls of the coupling means have, at least partly, converging slopes which match the slopes of the outer surfaces of the adaptor, which produces a wedge or locking effect between the sloping surfaces of the adaptor and those of the coupling means in the coupling position.

~~In accordance with another characteristic of the invention, the coupling means of the tool comprise four rigid hooks located on the four ends of the side walls of the coupling means, positioned so that the master pin can be coupled with both the pair of front hooks and the pair of rear hooks, so that the tool can be coupled and fixed to the adaptor in two different positions, at an angle of 180° with respect to one another.~~

There are preferably two perforations on each side wall, opposite each other, and equidistant from the hooks on the same wall and axially aligned in the coupling position with the movable fixing means through the side walls of the adaptor, and the master pin being coupled in the pair of front hooks or in the pair of rear hooks,

- 3a -

The device is characterised in that the quick-coupling device comprises:

- an adaptor joinable to said articulated arm through at least one master pin, the adaptor comprising a substantially flat base plate with first side walls, and displaceable locking means protruding transversally through the first side walls; and
- 5 - coupling means attachable to the tool and comprising rigid hooks engageable with said at least one master pin and second side walls with openings aligned with the displaceable locking means of the adaptor when the device is in use in its locking position,

10 wherein the first side walls of the adaptor are, in use, locked between the second side walls of the coupling means,

wherein at least a part of the first side walls comprises first inclined surface portions converging in the coupling direction and/or at least a part of the second side walls of the coupling means comprise converging second inclined surface portions, such that the base plate of the adaptor is in contact with a corresponding substantially flat-surfaced portion of the tool when the adaptor is locked onto the coupling means and tool, respectively, by engaging the displaceable locking means with the openings of the coupling means,

15 wherein the coupling means of the tool comprise four rigid hooks located on the four ends of the second side walls of the coupling means, a pair of rigid hooks being located at a front portion and a pair of rigid hooks being located at a rear portion, said rigid hooks being positioned so that the at least one master pin is able to be coupled with both the pair of front hooks and with the pair of rear hooks, so that the tool is able to be coupled and fixed to the adaptor in two different positions, at an angle of 180° with respect to one another.

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due to the symmetrical positioning of the perforations, the movable fixing means of the adaptor, upon moving, are introduced in said perforations of the coupling means of the tool, the coupling means and the tool being joined in any of the possible coupling positions.

5 According to another characteristic of the invention, the perforations of the side walls of the tool have a section which gets smaller towards the outside, which matches with another section which gets smaller towards the outside of the fixing means to be housed inside of these during the coupling position.

10 In a preferred embodiment, the coupling means have in their front and rear parts means for housing the adaptor, which respectively have opposite sloping surfaces, and the end of the tool opposite to the master pin has at least one matching chamfer with a sloping surface so that, in the coupling position, the chamfer or chamfers can rest, without any play, on the sloping surfaces of the housing means located on the front or rear part of the coupling means, depending on the coupling
15 position.

 In accordance with another characteristic of the invention, at least one fixing means has a rod whose free end is visible from the outside, so that it can be determined visually whether the fixing element is housed inside the corresponding perforation.

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Brief description of the drawings

 The attached drawings illustrate, as a non-limitative example only, two forms of embodiment of the quick-coupling device for back-digger tools on machines, or similar ones to the object of the invention. In said drawings:

25 Fig. 1 is a perspective view of a first form of embodiment of the device, in which the adaptor and the tool are uncoupled;

 Fig. 2 is a front elevational view of the device in Fig. 1, in which the adaptor and the tool are uncoupled;

30 Fig. 3 is a perspective view of the device in Fig. 1, in which the adaptor and the tool are coupled;

 Fig. 4 consists of three front sectional views of three possible variations for one of the side walls of the coupling means for the device in Fig. 1;

 Figs. 5 and 6 are both elevational side views of the two coupling positions of a shovel on the arm of a back-digger machine;

35 Fig. 7 is a perspective view of a second form of embodiment of the invention device, in which the adaptor and the tool are uncoupled;

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Fig. 8 is also a perspective view of the device in Fig. 7, in which the adaptor and tool are in the process of being coupled;

Fig. 9 is a front, diagrammatical view of the adaptor and the coupling means according to the form of embodiment in the previous Figs. 7 and 8; and

5 Fig. 10 is a perspective view of the device in Fig. 7, in which the adaptor and the tool are coupled, the adaptor being in a position turned 180° with respect to the coupling position in the previous Figs. 7 and 8.

Detailed description of the drawings

10 Fig. 1 is a perspective view of a first form of embodiment of the device being the object of the invention, in which the adaptor 2 and the tool 3 are uncoupled.

The device comprises an adaptor 2 joined to the articulated arm 4 of the machine (represented in Fig. 5), via master pins 7 and 7', and is made up of a base 17 and side walls 10.

15 On the base 17 are movable fixing means 13, which together with the ends of the master pin 7 make the adaptor 2 couple securely to any tool 3 which has respective coupling means 1, whether this is a shovel, as in Fig.1, a bucket, hammers, clamps, grippers or pallet-fork lifters, etc.

20 As can be seen in Fig.1, the tool 3 does in fact have coupling means 1 which comprise side walls 9 whose ends are configured in the shape of rigid hooks 5, 5', 6 and 6', which can receive and grip, at least partly, the ends of the master pin 7.

Similarly, the side walls 9 have perforations, 8a and 8b, which can receive and hold, by locking, the movable fixing means 13 of the adaptor 2.

25 The positioning of the perforations 8a and 8b in the sides 9, and the positioning of the hooks 5, 5', 6 and 6' in the side walls 9, is longitudinally and transversally symmetrical so that, regardless of which hooks receive the master pin 7 of the adaptor 2, the movable means 13 of the adaptor 2 will be axially aligned with perforations 8a or 8b of the side walls 9 of the tool 3.

30 In Fig.1, the hooks 5 and 5', situated on the same end of the side walls 9, are about to receive the ends of the master pin 7. At this stage, the base 17 will sit on the corresponding surface 17' of the tool 3, and the fixing means 13 will remain axially aligned with the perforations 8b of the opposite end of the side walls 9. Similarly, if the tool 3 is turned 180° with respect to a vertical axis, the hooks 6 and 6' will receive the ends of the master pin 7, and the movable fixing means 13 of the adaptor 2 will remain axially aligned, this time, with the perforations 8a on the opposite
35 end, closest to the hooks 5 and 5'.

- 6 -

Special attention should be paid to the fact that the master pin 7 used to join the adaptor 2 to the articulated arm 4, is the same one used to couple the tool 3 to the adaptor via the hooks 5, 5' or 6, 6', since in known embodiments, there is no case of the master pin 7 being shared in such a way, with different master pins being used for coupling the adaptor 2 to the tool 3 and for joining said adaptor 2 to the articulated arm 4 of the machine. In the invention device, the number of parts and the number of worn elements are reduced, which is an important improvement on the durability, weight and play of the devices known.

In Fig. 2 another characteristic of the invention device can be seen. In said figure, a front view of the coupling means 1 of the tool 3 is shown, in which it can be seen how the side walls 9, with respect to the direction of coupling of the adaptor 2, indicated by the arrow in Fig.2, have converging slopes, so that the upper ends of the walls 9 are further apart than those of their lower ends.

Such positioning greatly helps the coupling between the adaptor 2 and the tool 3, because the walls 9 of the tool 3 act as a guide for the side walls 10 of the adaptor 2 introduced inside the space within the two walls 9 of the tool 3. This greatly helps the coupling of the tool in situations where before it was very difficult to carry out such manoeuvre, for example, for the coupling of a tool 3 which is on uneven ground, and leaning with respect to the horizontal surface or to the surface on which the machine is standing.

In addition, the walls 10 of the adaptor 2 also have a slope which matches the slope of the walls 9 of the tool 3, producing an automatic fit between the adaptor 2 and the tool 3 during coupling and, once coupled, when pressure is transmitted to the tool 3, in this case the shovel, the pressure is not concentrated exclusively on the claws 5, 6 and the master pin 7, but is distributed between the walls 9 and 10 of both main bodies, producing a locking effect between its respective contact surfaces 9', 10', which greatly allows the pressure to be distributed over the device and lengthens its useful life, since wear and tear by friction, due to unnecessary play or concentrations of pressure on small surfaces, are reduced.

It should be pointed out that it is not necessary for the sides walls 10 and 9 to entirely comprise of converging slopes, as long as the inner surfaces 9' of the side walls 9 and the outer surfaces 10' of their side walls 10, are at least partly sloped.

Fig. 4a is thus a section view of a side wall 9 of the tool 3, according to the embodiment in Fig.1, in which the whole wall is sloping. Fig.4b shows a second variation in which only the inner surface 9' of the side wall 9 is sloping and, lastly, Fig. 4c shows a third form of embodiment in which only the part 9' of the inner sur-

- 7 -

face of the side wall 9 is sloping. This latter embodiment shows a side wall 9 with one or several ribs which run inwards, (this is towards the opposite side wall), in this case being the surface 9' of the ribs which shows the desired slope. Obviously, the outer surfaces 10' of the side walls 10 can also be configured in the same way as the inner surfaces of the tool 3, the variations explained above also being possible.

In Fig.3 the tool 3 is coupled to the adaptor 2, and the fixing means 13 of the adaptor, upon moving perpendicularly through the walls 10, can be introduced inside the perforations 8b of the side walls 9 of the tool 3. When this happens, the movements of the adaptor 2 transmitted through the articulated arm 4 of the machine (shown in Figs. 5 and 6) are transmitted to the tool 3 as if it were the same solid mass.

The perforations 8 can have various different forms although all must fit the shape of the fixing means 13 for insertion inside them. Both the perforations 8 and the fixing means 13 can thus have round or polygonal sections, and may also get smaller towards the outside, producing a wedge effect upon introducing the fixing means 13 in the perforations 8.

According to the embodiment in the drawings, the fixing means 13 can be moved by the action of a hydraulic system 12, which comprises at least two pistons 14 activated by an electric valve. In this way, the movement of the fixing means 13 can be controlled from the cabin of the machine or from any other place which has hydraulic-fluid or electrical communication with the hydraulic system 12.

This system will also have a retention valve for retaining the fixing means 13 inside the perforations 8 in case the hydraulic system loses pressure.

Obviously, the actuating mechanism of the fixing elements 13 can also be mechanical or even manual, and can incorporate safety devices to block the position of the fixing means 13 inside the perforations 8a or 8b.

As a safety element, the side walls 10 of the adaptor 2, at the opposite end to that of the master pin 7, are in the shape of a hook 18, whose open or eye section, in the coupling position, coincides with the hooks 5 and 5' or 6 and 6', depending on the coupling position, allowing a safety master pin to pass through them, joining the adaptor 2 and the tool 3. The hook configuration 18 will also, if necessary, mean that the hooks can act as lifting hooks, so that through their open end the adaptor can be suspended by a supporting cable.

Figs. 5 and 6 show the arm 4 of a back-digger machine or similar, in whose end the adaptor 2 is fixed respectively via the master pins 7 and 7', and in which the tool 3, in this case a shovel, is coupled to the adaptor, in two different positions,

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turned 180° respectively with respect to one another and according to an imaginary axis of rotation 19.

A second form of embodiment of the quick-coupling device for tools on digger machines or similar is shown in Figs. 7, 8 and 9. In said figures, for simplification, the same numerical references have been used to indicate the same or similar components with respect to the description of the first form of embodiment in Figs. 1 to 6.

As can be seen in Fig. 7, the device comprises an adaptor 2, joined to the articulated arm of the machine via master pins 7 and 7', and is made up of a base 17 which is essentially flat and side walls 10. The ends of the master pin 7, located at the front end of the adaptor 2, are to be received and partially gripped by the front hooks 5, 5', or by the rear hooks 6, 6', of the coupling means 1 of the tool 3. In this way, and in the same way as in the previous embodiment, the device is reversible since the tool 3 can be coupled to the adaptor 2 using the coupling means 1, in two positions which are both turned 180° with respect to an imaginary vertical axis 19.

In Fig. 7, in which the adaptor 2 and the tool 3 are separate, it can also be seen that the coupling means 1 have housing means 21, 21' and 22, 22' respectively on their front and rear parts, for the adaptor 2. Said housing means consist in protruding extensions in the form of prismatic wedges. These prismatic wedges have sloping surfaces 24, those of the forward wedge being directly opposite those of the opposite end of the coupling means 1, with which said sloping surfaces of the front wedges 21, 21' are facing the corresponding sloping surfaces of the rear wedges 22 y 22'. While the adaptor 2 is being coupled, this characteristic makes the end of the adaptor 2 opposite to the master pin 7 rest on said sloping surfaces, and the adaptor 2 is forced to move towards its front end, so that the master pin 7 fits securely in the hooks of the locking means and the base 17 is in contact with a corresponding portion, with an essentially flat surface 17', of the tool 3 or the coupling means 1.

To improve the effect produced by the sloping surfaces of the wedges 21, 21' and 22, 22', the adaptor 2 has respective chamfers on each of its side walls 10, with slopes which match those of the wedges, so that in the coupling position the chamfers rest, without any play, on the sloping surfaces of the front or rear wedges, depending on the positioning of the coupling.

In Fig. 8, the ends of the master pin 7 are introduced in the hooks 5 and 5' and the rear wedges 22 and 22' have still not yet been supported by the chamfers 23 of the adaptor 2. In this figure, the movable fixing means 13 can be seen posi-

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tioned at the same distance with respect to the master pins 7 and 7', while the perforations 8 of the side walls 9 of the coupling means 1 are at the distance with respect to the front hooks 5, 5' and rear hooks 6, 6'. In this way the fixing means 13 of the adaptor, upon being moved perpendicularly through the walls 10 of the adaptor, can be inserted inside the perforations 8 of the side walls 9 of the coupling means 1 to transmit the movements of the adaptor 2 to the tool 3, whatever the positioning of the coupling, in the same way as that of the first form of embodiment.

By having the same shape as the fixing means 13 getting smaller towards the outside, to match the section with the perforations 8, upon introducing the fixing means in the perforations, a wedge effect is produced, which forces the adaptor 2 to move towards the tool 3 and, due to the effect of the sloping surfaces of the wedges 22 and 22' (depending on the positioning of the coupling in Figs. 6 and 7) the adaptor 2 is also forced to move in a direction towards its front end, ensuring the correct coupling between itself and the tool 3.

As can be seen in Fig. 9, and different from the first form of embodiment, the inner surfaces of the walls 9 of the coupling means are not sloped at all and are perpendicular to the surface 17' of the tool 3. Nevertheless, in order to guide the coupling of the adaptor and to help introduce it between the walls 9 of the coupling means 1, the outer surface of the side walls 10 of the adaptor 2 have sloping guiding surfaces 10'. In the example given in the drawings, said guiding surfaces are positioned around the protruding ends of the master pins 7 and 7', and are cone shaped whose imaginary axis coincides with the longitudinal axis of the master pins. In this way, whatever the slope of the adaptor 2 with respect to the tool 3 during the coupling process, the guiding surfaces 10' which are in contact with the walls 9 of the coupling means converge in the direction of coupling and act as guides to ensure the adaptor 2 is correctly introduced between said walls 9.

In Fig. 10, in which the adaptor 2 is coupled to the tool 3 via the coupling means 1, it can be seen that the inventor also provided for the adaptor 2 to have at least one perforation 25, positioned level with the rear master pin 7', and in one of the side walls 10, which communicates the upper surface of said wall 10 with the perforation for housing the master pin 7'. This master pin 7' has its own respective perforations which are axially aligned with the perforations 25, enabling the end of the safety master pin, introduced through the perforations 25 of the adaptor 2, to be housed. In this way, the safety master pin prevents the master pin 7' from moving, securing its position in the adaptor 2, which joins the adaptor to the mechanical arm 4 of the machine.

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Also in Fig. 10, the adaptor 2 is coupled to the tool 3 in a position which is turned 180° with respect to the coupling position shown in the previous Figs. 7 and 8, without needing to change or replace the tool 3 with another whose coupling means can be adjusted to the new coupling positioning. Using the same adaptor 2
5 and the same tool 3, the latter can be coupled in different positions, greatly improving what other known devices can offer.

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CLAIMS

1. A quick-coupling device (1, 2) for coupling tools (3) on machines, especially agricultural, transport, lifting, digging and earth-moving machines, said machines comprising an articulated arm (4) having a distal end portion to which a rigid tool (3) is couplable,
- 5 characterised in that the quick-coupling device (1, 2) comprises:
- an adaptor (2) joinable to said articulated arm (4) through at least one master pin (7), the adaptor comprising a substantially flat base plate (17) with first side walls (10), and displaceable locking means (13) protruding transversally through the first
 - 10 side walls (10); and
 - coupling means (1) attachable to the tool (3) and comprising rigid hooks (5, 5', 6, 6') engageable with said at least one master pin (7) and second side walls (9) with openings (8) aligned with the displaceable locking means (13) of the adaptor (2) when the device is in use in its locking position,
 - 15 wherein the first side walls (10) of the adaptor (2) are, in use, locked between the second side walls (9) of the coupling means (1),
- wherein at least a part of the first side walls (10) comprises first inclined surface portions (10') converging in the coupling direction and/or at least a part of the second side walls (9) of the coupling means (1) comprise converging second
- 20 inclined surface portions (9'), such that the base plate (17) of the adaptor (2) is in contact with a corresponding substantially flat-surfaced portion (17') of the tool (3) when the adaptor (2) is locked onto the coupling means (1) and tool (3), respectively, by engaging the displaceable locking means (13) with the openings (8) of the coupling means (1),
- 25 wherein the coupling means (1) of the tool (3) comprise four rigid hooks (5,5', 6,6') located on the four ends of the second side walls (9) of the coupling means (1), a pair of rigid hooks (5, 5') being located at a front portion and a pair of rigid hooks (6, 6') being located at a rear portion, said rigid hooks (5,5', 6,6') being positioned so that the at least one master pin (7) is able to be coupled with both the pair of front
- 30 hooks (5,5') and with the pair of rear hooks (6,6'), so that the tool (3) is able to be coupled and fixed to the adaptor (2) in two different positions, at an angle of 180° with respect to one another.
2. The device of claim 1, wherein the outer surface of the side walls (10) of the adaptor
- 35 (2) have sloping guiding surfaces (10') around the protruding ends of at least one

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master pin (7,7'), said surfaces being cone-shaped with an imaginary axis being coincident with the longitudinal axis of the master pin (7,7').

3. The device of claim 1, wherein at least a part of the first side walls (10) comprises first inclined surface portions (10') converging in the coupling direction and at least a part of the second side walls (9) of the coupling means (1) comprise converging second inclined surface portions (9'), said converging second inclined surface portions (9') matching the first inclined surface portions (10') so as to achieve a wedge effect between the first inclined surface portions (10') and the converging second inclined surface portions (9').

4. The device of any of claims 1-3, wherein there are two perforations (8) on each side wall (9), opposite each other, and equidistant from the hooks on the same wall (9) and axially aligned in the coupling position with the movable fixing means (13) through the side walls (10) of the adaptor (2), and the master pin (7) being coupled in the pair of front hooks (5,5') or in the pair of rear hooks (6, 6'), due to the symmetrical positioning of the perforations (8), the movable fixing means (13) of the adaptor (2), upon moving, are introduced in the said perforations (8) of the coupling means (1) of the tool (3), the coupling means (2) and the tool (3) being joined in any of the possible coupling positions.

5. The device of claim 4, wherein the perforations (8) of the side walls (10) of the tool (3) have a section which gets smaller towards the outside, which matches with another section which gets smaller towards the outside of the fixing means (13) to be housed inside of these during the coupling position.

6. The device of any of claims 1-5, wherein the coupling means (1) have in their front and rear parts means for housing the adaptor (2), which respectively have opposite sloping surfaces, and in that the end of the tool (2) opposite the master pin (7) has at least one matching chamfer with a sloping surface so that, in the coupling position, the chamfer or chamfers can rest, without any play, on the sloping surfaces of the housing means located on the front or rear part of the coupling means (1), depending on the coupling position.

7. The device of any of claims 1-6, wherein at least one fixing means (13) has a rod

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(16) whose free end is visible from the outside, so that it can be determined visually whether the fixing element (13) is housed inside the corresponding perforation (8).

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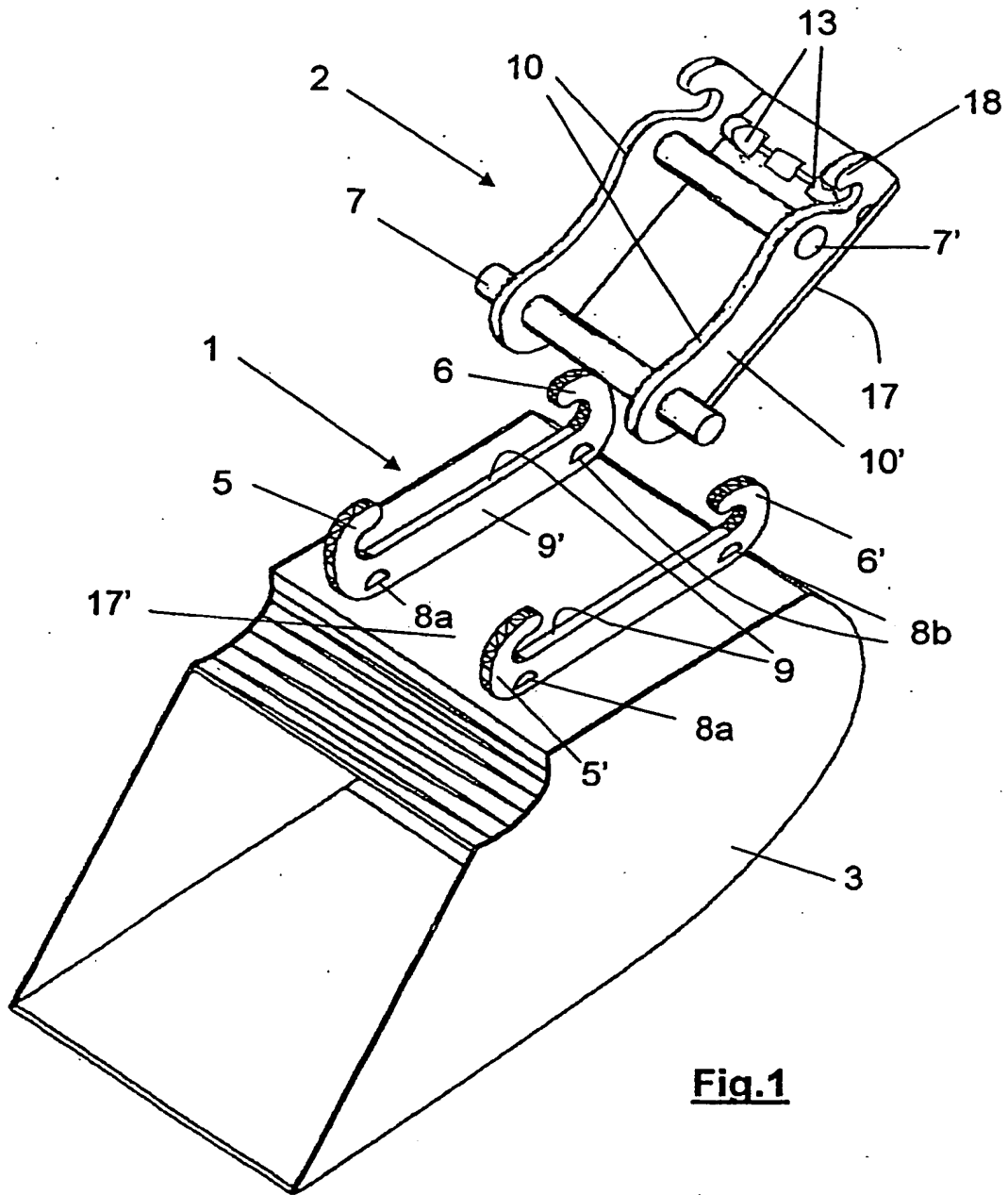


Fig.1

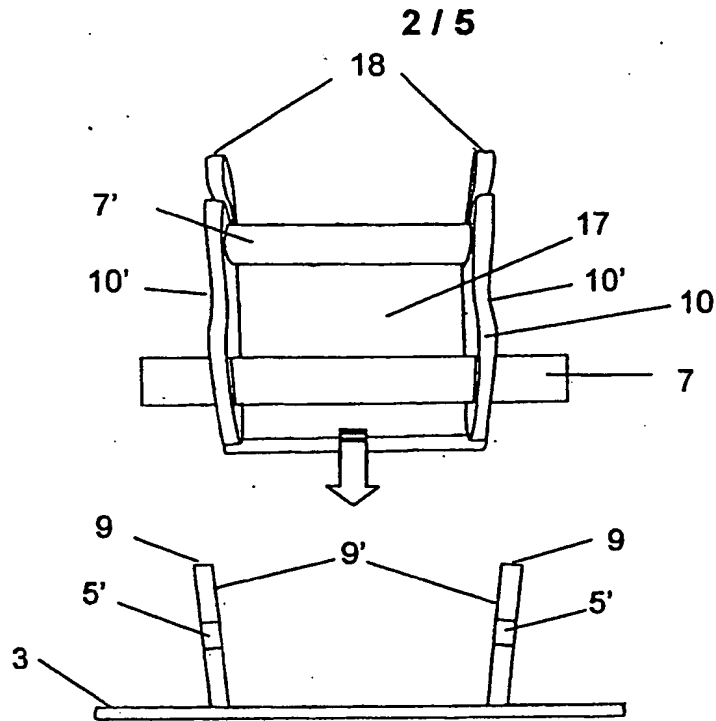


Fig.2

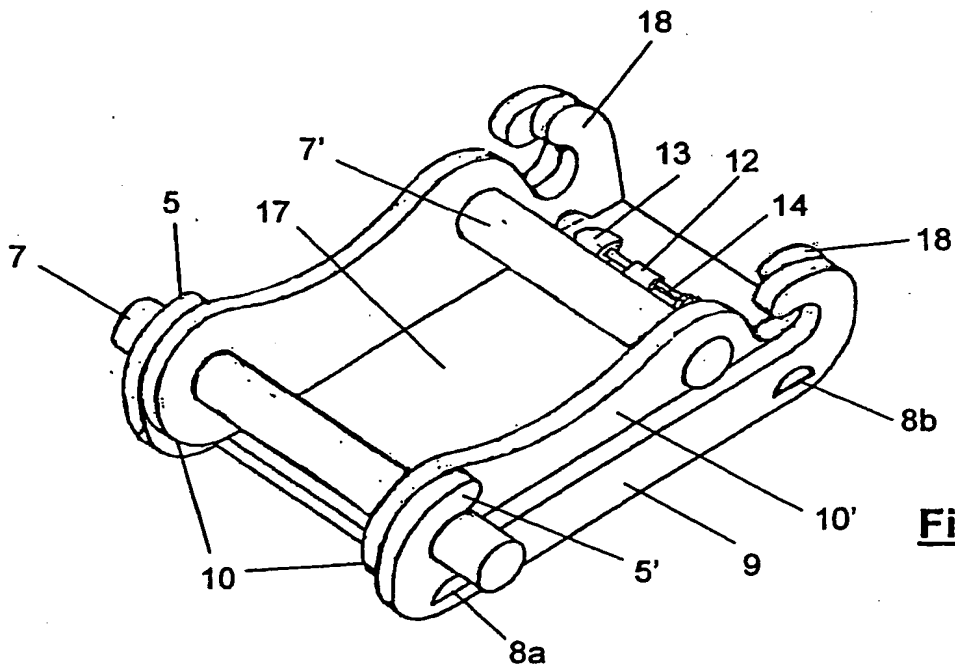


Fig.3

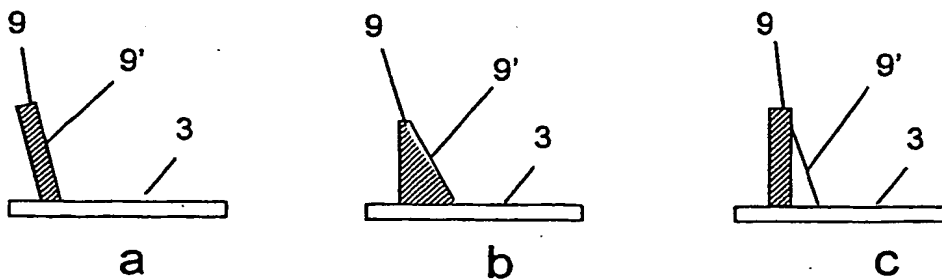


Fig.4

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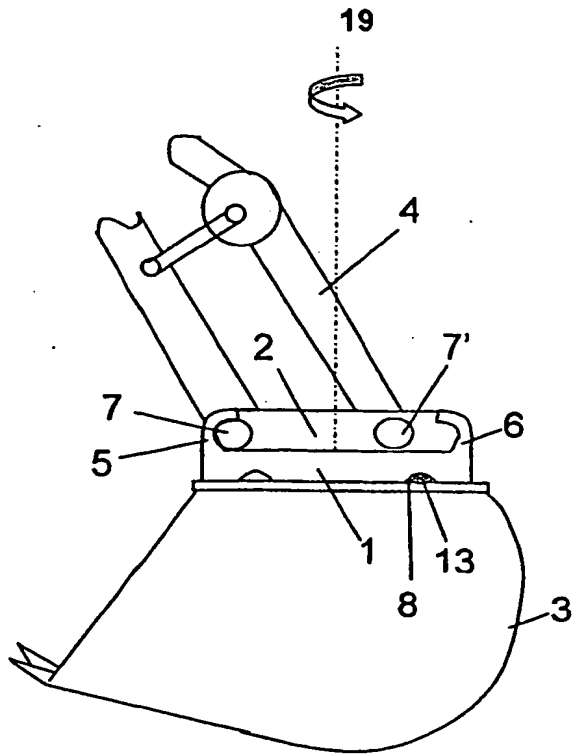


Fig.5

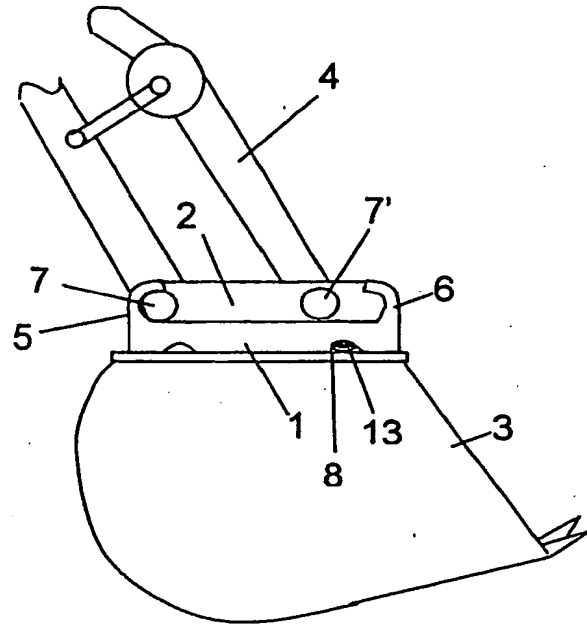


Fig.6

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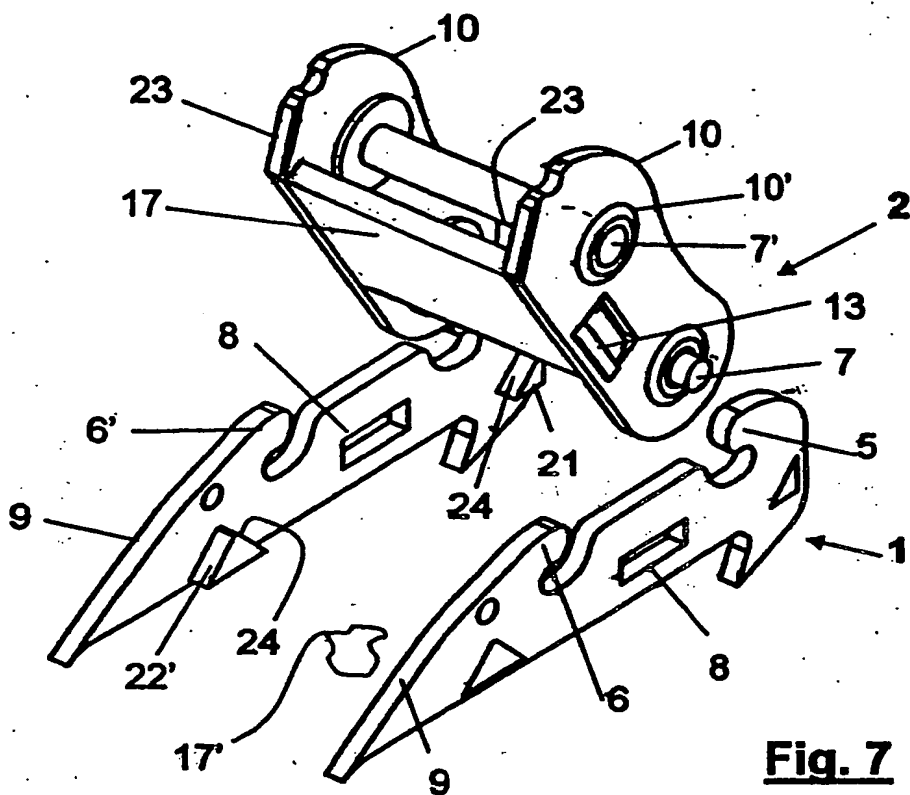


Fig. 7

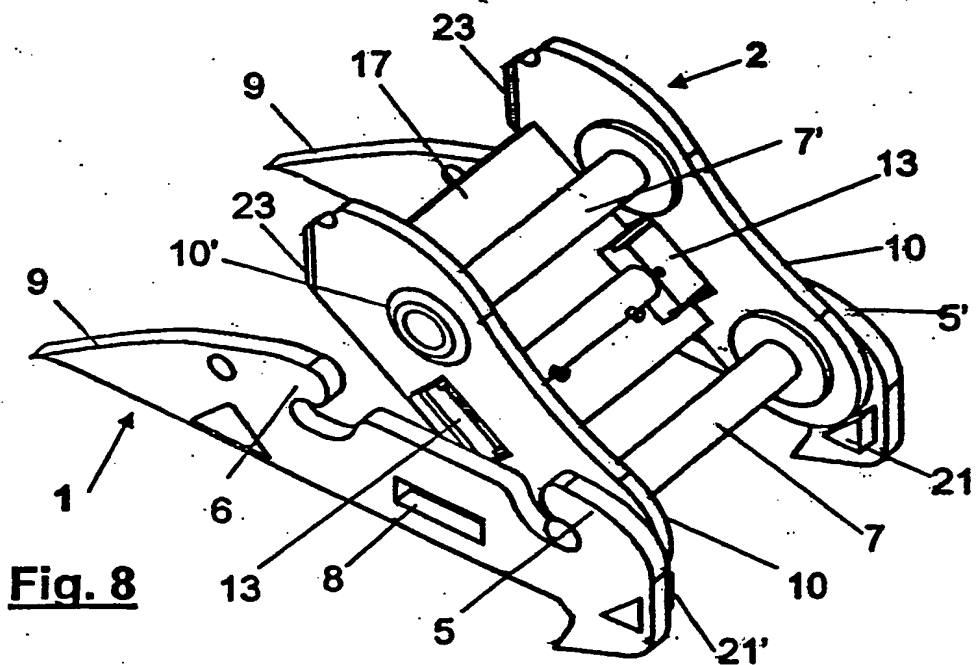


Fig. 8

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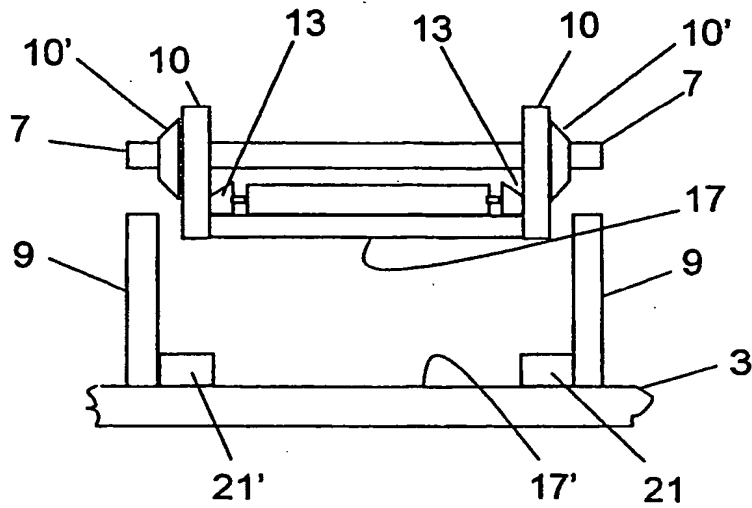


Fig. 9

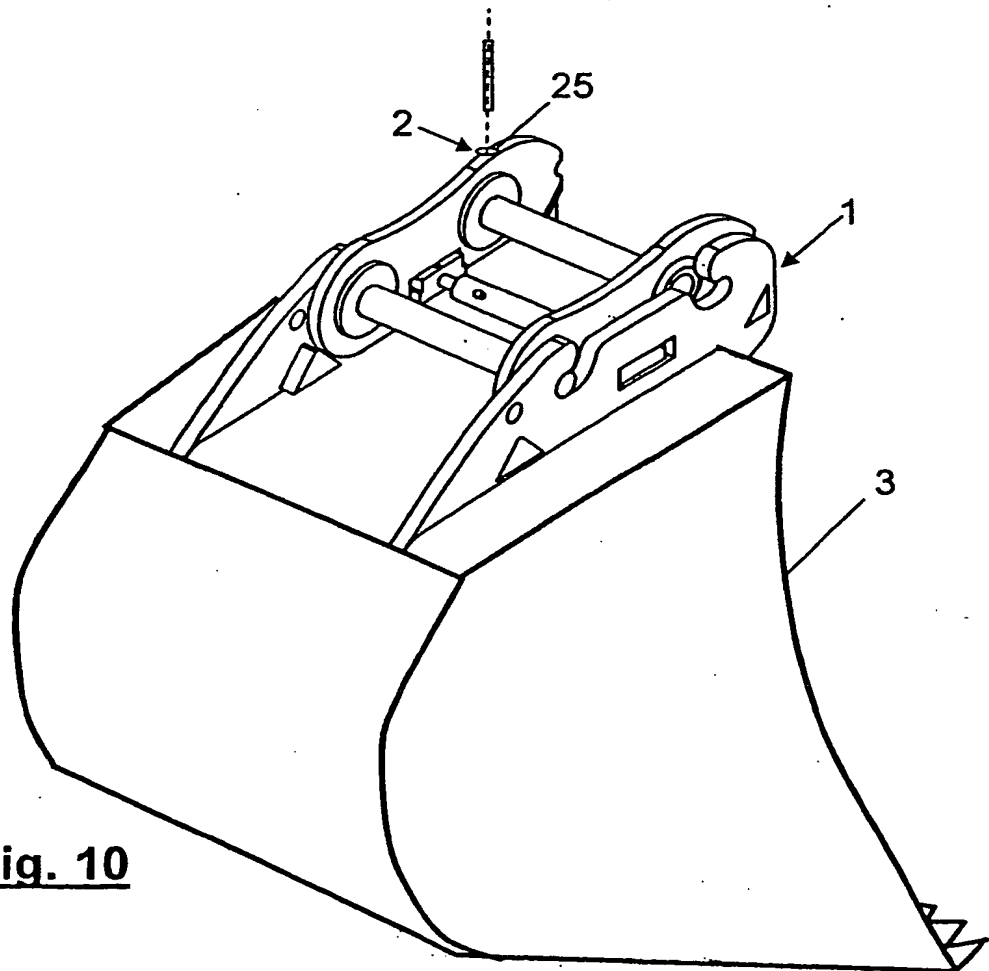


Fig. 10